

CLAIMS

1. A molecular memory integrated circuit, comprising:

a first cell coupled with a second cell, wherein:

the first cell includes:

a first actuator coupled with a first platform;

a first cantilever coupled with the first platform; and

the second cell includes:

a second actuator coupled with a second platform; and

a memory device coupled with the second platform.
2. The molecular memory integrated circuit of claim 1, wherein:

the first cantilever couples the first cell with the second cell.
3. The molecular memory integrated circuit of claim 2, wherein:

a first input source is coupled with the first actuator; and

the first actuator moves the first platform when directed by the first input source.
4. The molecular memory integrated circuit of claim 2, wherein:

a second input source is coupled with the second actuator; and

the second actuator moves the second platform when directed by the second input source.

5. The molecular memory integrated circuit of claim 2, wherein:

the first cantilever is coupled with the memory device;

an input source is coupled with the first actuator;

the input source is coupled with the second actuator;

the first actuator moves the first platform when directed by the input source; and

the second actuator moves the second platform when directed by the input source.

6. A molecular memory integrated circuit, comprising:

a first cell coupled with a second cell, wherein:

the first cell includes:

a first actuator coupled with a first platform;

a first cantilever coupled with the first platform; and

the second cell includes:

a second actuator coupled with a second platform;

a memory device coupled with the second platform; and

the first cantilever includes a first cantilever tip; and

the first cantilever extends away from the first cell and towards the second cell.

7. A molecular memory integrated circuit, comprising:
- a molecular array read/write engine including:
 - a plurality of actuators;
 - a plurality of cantilevers, at least one of the plurality of cantilevers having a cantilever tip;
 - a plurality of interconnects; and
 - a plurality of interconnect nodes;
 - a memory device with a plurality of memory zones;
- whereby when a control signal is sent to the molecular array read/write engine, the control signal instructs the molecular array read/write engine to position the plurality of cantilevers such that the plurality of cantilever tips make contact with the memory device;
- whereby each memory zone makes contact with at least one of the plurality of cantilever tips.
8. The molecular memory integrated circuit of claim 7, whereby the memory device is read by applying a sensing signal through the cantilever tip and into the memory device.
9. The molecular memory integrated circuit of claim 7, whereby the memory device is written to by applying a write signal through at the cantilever tip and into the memory device.

10. A molecular memory integrated circuit, comprising:
- a molecular array read/write engine including:
 - a plurality of actuators;
 - a platform;
 - a plurality of cantilevers, at least one of the plurality of cantilevers having a cantilever tip;
 - a plurality of interconnects; and
 - a plurality of interconnect nodes;
 - a memory device;
 - wherein the plurality of cantilevers are passive; and
 - wherein at least one cantilever from the plurality of cantilevers has a curve such that the corresponding cantilever tip extends away from the platform and towards the memory device.
11. The molecular memory integrated circuit of claim 10, whereby the memory device is read by applying a sensing signal through the cantilever tip and into the memory device.
12. The molecular memory integrated circuit of claim 10, whereby the memory device is written to by applying a write signal through the cantilever tip and into the memory device.
13. A molecular memory integrated circuit, comprising:

a molecular array read/write engine including:

- a plurality of actuators;
- a platform;
- a plurality of cantilevers, at least one of the plurality of cantilevers having a cantilever tip;
- a plurality of interconnects; and
- a plurality of interconnect nodes;

a memory device;

wherein the plurality of cantilevers are passive; and

wherein at least one cantilever from the plurality of cantilevers has a curve such that the corresponding cantilever tip extends away from the platform and contacts the memory device.

14. The molecular memory integrated circuit of claim 13, whereby the memory device is read by applying a sensing signal through the cantilever tip and into the memory device.

15. The molecular memory integrated circuit of claim 13, whereby the memory device is written to by applying a write signal through the cantilever tip and into the memory device.

16. A memory apparatus, comprising:

- a media platform having a first substrate comprising silicon dioxide;

a read/write mechanism, including:

a read/write platform having a second substrate comprising silicon dioxide; and

one or more cantilever tips connected with said read/write platform;

a media platform movement mechanism operably attached to said media platform and configured to move said media platform in response to media control signals; and

a read/write platform movement mechanism operably attached to said read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform.

17. The memory apparatus of claim 16, wherein the media platform and the read/write platform have substantially the same thermal expansion rates.

18. The memory apparatus of claim 16, whereby the media platform is read by applying a sensing signal through at least one of the one or more cantilever tips and into the media platform.

19. The memory apparatus of claim 16, whereby the media platform is written to by applying a write signal through at least one of the one or more cantilever tips and into the media platform.

20. A memory apparatus, comprising:

a media die having a plurality of media platforms;

a read/write die having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:

a read/write platform comprising a material having a low thermal coefficient;

and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein each of the plurality of read/write mechanisms is sized such that the one or more cantilever tips can remain aligned with data previously written to the corresponding media platform across an operating temperature range.

21. The memory apparatus of claim 20,

wherein each of the plurality of read/write mechanisms is adapted to be individually accessed; and

wherein the material is silicon dioxide.

22. The memory apparatus of claim 20, whereby the memory die is read by applying a sensing signal through at least one of said one or more cantilever tips and into the media platform.

23. The memory apparatus of claim 20, whereby the memory die is written to by applying a write signal through at least one of said one or more cantilever tips and into the media platform.

24. The memory apparatus of claim 20, wherein each of the plurality of read/write mechanisms is adapted to be individually moved.

25. The memory apparatus of claim 20, wherein the plurality of read/write mechanisms are adapted to be multiplexed.

26. The memory apparatus of claim 20, wherein each of the cantilever tips can be individually accessed.

27. A memory apparatus, comprising:

a media cell having a plurality of media platforms;

a read/write cell having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:

a read/write platform; and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein each of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein each of the plurality of read/write mechanisms is sized such that the plurality of read/write mechanisms can operate across an industrial temperature range without thermal compensation.

28. The memory apparatus of claim 27, whereby the media cell is read by applying a sensing signal through at least one of the one or more cantilever tips and into the media platform.

29. The memory apparatus of claim 27, whereby the media cell is written to by applying a write signal through at least one of the one or more cantilever tips and into the media platform.
30. The memory apparatus of claim 27, wherein each of the plurality of read/write mechanisms is adapted to be individually accessed.
31. The memory apparatus of claim 27, wherein each of the plurality of read/write mechanisms is adapted to be individually moved.
32. The memory apparatus of claim 27, wherein the plurality of read/write mechanisms are adapted to be multiplexed.
33. The memory apparatus of claim 27, wherein each of the cantilever tips can be individually accessed.
34. An apparatus for use as cache memory in a computer system, comprising:
- a media die having plurality of media platforms;
 - a read/write die having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:
 - a read/write platform; and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein the plurality of read/write mechanisms are adapted to be multiplexed.

35. The apparatus of claim 34, whereby the media platform is read by applying a sensing signal through at least one of the one or more cantilever tips and into the media platform.

36. The apparatus of claim 34, whereby the media platform is written to by applying a write signal through at least one of the one or more cantilever tips and into the media platform.

37. A computing system having improved power-up latency, comprising:

a microprocessor;

a hard disk drive electrically connected with the microprocessor;

a cache memory device electrically connected with the microprocessor and the hard disk drive, the cache memory device including:

a media die having plurality of media platforms;

a read/write die having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:

a read/write platform; and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein the plurality of read/write mechanisms are adapted to be multiplexed.

38. A server system, comprising:

one or more microprocessors;

one or more cache memory devices electrically connected with the one or more microprocessors, at least one of the cache memory devices including:

a media die having plurality of media platforms;

a read/write die having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:

a read/write platform; and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein the plurality of read/write mechanisms are adapted to be multiplexed.

39. A memory apparatus, comprising:

a media die having a plurality of media platforms;

a read/write die having a plurality of read/write mechanisms, each of the plurality of read/write mechanisms including:

a read/write platform; and

one or more cantilever tips connected with said read/write platform;

a plurality of media platform movement mechanisms, each of the plurality of media platform movement mechanisms operably attached to a corresponding media platform and configured to move said media platform in response to media control signals; and

a plurality of read/write platform movement mechanisms, each read/write movement mechanism operably attached to a corresponding read/write platform and configured to move said read/write platform in response to read/write platform control signals;

wherein at least one of said one or more cantilever tips can cause the formation of an anomaly on said media platform;

wherein each of the plurality of read/write mechanisms is sized such that thermal expansion of the read/write platform across an operating temperature range does not cause misalignment of the one or more cantilever tips with data previously written to the corresponding media platform.

40. A molecular memory integrated circuit, comprising:

a first die, including:

a first plurality of interconnect nodes coupled with a first plurality of

interconnects;

a first cell, including:

a first actuator coupled to a first interconnect node through a first interconnect and the first actuator coupled to a second interconnect node through a second interconnect forming a first input to the first actuator;

a first pull-rod coupling the first actuator with a first platform;

the first platform including a cantilever that includes a cantilever tip; and

a third interconnect node coupled with the cantilever through a third interconnect;

a second die, including:

a second plurality of interconnect nodes coupled with a second plurality of interconnects;

a second cell, including:

a second actuator coupled to a fourth interconnect node through a fourth interconnect and the second actuator coupled to a fifth interconnect node through a fifth interconnect forming a second input to the second actuator;

a second pull-rod coupling the second actuator with a second platform;

the second platform connected with a memory device; and

the first die is connected with the second die through contact of the cantilever tip with the memory device.

41. A method for using a molecular memory integrated circuit, comprising:

positioning a first platform that includes a cantilever, which includes a cantilever tip, near a second platform that includes a memory device; and
moving the first platform such that the cantilever tip contacts the memory device at a specific location.

42. A molecular memory integrated circuit, comprising:

a first die coupled with a second die, wherein:

the first die includes:

a first interconnect node coupled with a first cell through a first interconnect;

wherein the first cell, includes a first actuator, including a first top stage and a first bottom stage, coupled with a first platform through a first pull-rod; and

wherein the first platform includes a first molecular array read/write engine, including a first cantilever, which includes a first cantilever tip; and

the second die, includes:

a second interconnect node coupled with a second cell through a

second interconnect;

wherein the second cell, includes a second actuator, including a second top stage and a second bottom stage, wherein the second actuator is coupled with a second platform through a second pull-rod; and

wherein the second platform includes a memory device.

43. A molecular memory integrated circuit comprising:

a first set of cells coupled with a second set of cells, wherein:

each cell from said first set comprises:

a head platform;

an array of cantilevers on the head platform, each cantilever

comprising:

an atomic probe tip;

a plurality of actuators for moving the head platform;

each cell from said second set comprises:

a media platform;

a plurality of actuators for moving the media platform;

44. The molecular memory integrated circuit of claim 43, wherein each cell from said first set of cells can be moved independently from each other cell from said first set.

45. The molecular memory integrated circuit of claim 44, wherein each cell from said second set of cells can be moved independently from each other cell from said second set.

46. The molecular memory integrated circuit of claim 43, wherein each head platform and each media platform are made from low thermal coefficient material such as glass or a thermal oxide.

47. The molecular memory integrated circuit of claim 43, wherein each head platform and each media platform can be independently accessed allowing for parallel readout, writing, and erasing.